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JCS 80 U.S. PTO

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EXPRESS MAIL NO. EL541224029US

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

UTILITY PATENT APPLICATION TRANSMITTAL LETTER

JC490 U.S. PTO
09/657915 PTO
09/08/00

Atty. Docket No.: CE08810R

Mailing Date: Herewith

Express Mail Label No.: EL541224029US

To: Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

Dear Sir:

Transmitted herewith for filing under 37 CFR 1.53 (b) is a Nonprovisional Utility Patent:

New Application based on Provision Application No. 60/152,741, filed on 9/08/99;
or a _____ Continuation, _____ Division, or _____ Continuation-in-Part (CIP)
Application of prior US application No. _____ / _____, filed on _____, having US
Examiner _____, in Group Art Unit _____ : of

Inventor(s): Gino Anthony Scribano and Robert T. Love

For (Title): **PACKET TRANSMISSION METHOD**

This transmittal letter has 2 total pages.

Enclosed are:

1 sheets of drawings, along with 7 pages of specification and claims,

Unsigned Oath or Declaration Combined with Power of Attorney (3 pages)
 Newly Executed (original or copy)
 Copy from a prior application (if this is a Continuation/Division with no new matter)
 Statement deleting named inventor(s) in prior application if this is a
Continuation/Division (See 37 CFR 1.63(d)(2) and 1.33(b).)
 Consider as the above Statement, Please delete as inventors for this application
the following inventors named in the prior application: _____

A certified copy of a _____ (non-US) application
S/N _____ /, having a filing date of _____, and foreign priority to this non-US application for
the present application is hereby claimed under 35 USC 119.

An Assignment Transmittal Letter and Assignment of the invention to MOTOROLA, INC.

An Information Disclosure Statement (IDS), with _____ PTO-1449, and
_____ citation copies.

Preliminary Amendment

Return Receipt Postcard

Petition For Extension of Time for parent application of the present Continuation/Division/CIP
application

Instructions:

Incorporation by Reference (for Continuation/Division application) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

Since the present application is based on a prior US application, please amend the specification by adding the following sentence before the first sentence of the specification: "The present application is based on prior US application No. _____ / _____, filed on _____, which is hereby incorporated by reference, and priority thereto for common subject matter is hereby claimed."

Please cancel filed claims _____.

The filing fee is calculated as follows:

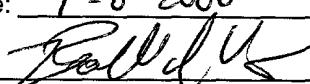
CLAIMS AS FILED, LESS ANY CANCELED BY AMENDMENT

	NUMBER OF CLAIMS	NUMBER EXTRA	RATE	FEE
TOTAL CLAIMS	- 20 =		X \$18	= \$0.00
INDEPENDENT CLAIMS	- 3 =		X \$78	= \$0.00
MULTIPLE DEPENDENT CLAIMS			\$260	= \$0.00
			BASIC FEE	= \$690.00
			TOTAL FILING FEE	= \$690.00

Please charge Deposit Account No. 13-4768 in the amount of \$ 690.00 for the Total Filing Fee. Two duplicate copies of this sheet are enclosed.

The Commissioner is hereby authorized to charge any additional fees which may be required now or in the future under 37 CFR 1.16 or 37 CFR 1.17, including any present or future time extension fees which may be required, or credit any overpayment to Deposit Account No. 13-4768. Two duplicate copies of this sheet are enclosed.

Date: 9-8-2000

Signature: 

Please forward all correspondence to:
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Libertyville, IL 60048

Printed Name: Randall S. Vaas
Attorney for Applicant(s)
Registration No. 34,479
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Fax: (847) 523-2350

PACKET TRANSMISSION METHOD

RELATED APPLICATION

This application claims priority from US Provisional Application 60/152,741, filed on September 8, 1999, entitled SUPPORT OF 3G POWER CONTROL, the disclosure of which is incorporated herein by reference thereto.

FIELD OF THE INVENTION

The present invention pertains to packet transmission, and more particularly to packet transmission between cellular base transceiver stations and network switches.

BACKGROUND OF THE INVENTION

Packets, or frames, communicated from the base transceiver stations (BTSs) and the Radio Network Controllers (RNCs) in a wireless cellular data communication system, such as a code division multiple access (CDMA) system, contain a header with control and quality information and a payload containing data. These communications are commonly referred to as backhaul. In these systems, the loading may include data, control messages, or other information relating to mobile station or base transceiver station operation. When data is not present, the data payload portion of the packet or frame may comprise fill bits. The RNC ignores these fill bits.

Backhaul loading can limit the overall system capacity. In many situations, backhaul loading is not a problem. However, as data demands rise, and capacity reaches its limits in existing systems, backhaul loading can limit system capacity. Accordingly, what is needed is a method of reducing loading without negatively impacting on communications.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is block diagram illustrating a cellular communication system.

5 FIG. 2 illustrates a frame or packet communicated between the base transceiver stations and the network in the communication system according to FIG. 1.

DETAILED DESCRIPTION OF THE DRAWINGS

10 A wireless system includes base station transceivers to communicate with at least one mobile station, the base station transceivers communicate with a network controller. The base station controls a header for a packet frame to be communicated between the base station transceiver and the network controller wherein a portion of the header identifies the frame as one containing no data package. The data bits of the header field may contain a predetermined bit pattern for a frame including no data package. Information received by the base station from the mobile station may be dropped, and the header information replaced with the specified bit pattern, if a decoding metric passes a threshold. The information received by the base station from the mobile station may be dropped, and the header information replaced with the specified bit pattern, if a CRC for the frame received from the mobile station fails.

15 A cellular system 100 is disclosed in FIG. 1. The illustrated cellular system 100 is a code division multiple access system including a plurality of base transceiver stations (BTS) 102-104 in communication with a mobile station MS 108 that communicate over respective wireless communication paths. Those skilled in the art will recognize that typically more than three base transceiver and more than one mobile station will be present in a system. The base transmission stations 102-103 are connected to a mobile switching system network 110. The infrastructure (network controller) responsible for controlling, coordinating, and initializing base transceiver stations, is commonly known as the central base station controller (CBSC), or radio network controller (RNC), or the selection/distribution unit (SDU). Digital cellular systems of this type are well known. During normal operation,

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backhaul communications are made between the BTS and network controller both for system control and outgoing communications.

For packet, circuit, or voice data it is not necessary to transmit the packet payload from the BTS to the RNC when the BTS demodulator is not decoding a signal from the MS. It is envisioned that a bit or unassigned bit pattern is added to a header in the packet 200 (FIG. 2). Preferably, an existing bit field in the header for communications between the base transceiver station and the network controller to indicate that the data payload is empty. Although any header can be used, the bits in the header that would have been used for signal error rate (SER), such as the "Signal to Thermal Noise Ratio" octet in packet 200. When a data payload ("Reverse Link Information") is present, this field is used to indicate signal quality. If a payload is not present, the field can be advantageously employed to transmit a predetermined bit pattern (or one bit of the octet can be a flag) indicating that a payload is not present.

In operation, the BTSs 102-104 insert the predetermined bit, or pattern, into the selected field when transmitting a signal to the RNC 110. The RNC checks to see if the predetermined pattern, or flag bit, in the header indicate whether "Reverse Link Information", referred to herein as payload is present. If the payload is present, it is processed in the ordinary manner. If a payload is not present, the frame is processed in the same manner as if the payload was all fill bits.

Those skilled in the art will recognize that the cyclic redundancy check (CRC), which is in the data payload, may not be present if the data payload is removed from the packet, or frame. It is envisioned that a CRC can be provided for the header, or the payload CRC can be used. If the payload CRC is used where the payload is dropped, it will be calculated only over the header.

Thus it can be seen that a bit pattern of the frame type bit field of the packet header can be selected to indicate that a payload is not attached. Alternately a new field can be used in the packet header.

The invention can be advantageously employed to more efficiently use the reverse backhaul bandwidth by not passing up filler data for frame intervals when none of the fingers allocated by a BTS to a given user are in

lock. An example of where fill data is transmitted in existing systems is when none of the channel demodulator's (fingers) corresponding to a given mobile station (or end user equipment) communication link are in "lock", which can happen to the weaker serving leg during soft handoff to a stronger serving leg.

5 Normal operation at the base transceiver station (BTS) of a code division multiple access (CDMA) cellular system requires assigning fingers to the signal paths received at a serving base station in communication with a mobile station. Finger assignment is determined by a set of finger management rules applied to active (active meaning that fingers (demodulators) are currently assigned to the offset) pseudo noise (PN) offsets and potential PN offset candidates after each search time interval. PN offset candidates are determined by the searcher when the energy of a given signal path exceeds some search threshold. Active PN offsets have fingers assigned to them and are demodulated followed by soft combining and decoding.

10 When a finger's energy assigned to an active PN offset goes below a "lock" threshold, the finger is deassigned such that no demodulation takes place for that finger and it no longer is used in diversity combining. The deassigned finger can then be assigned to a more promising PN candidate if one exists. If the searcher does not detect any PN offsets with sufficient energy to report to the finger manager and the existing active (locked) fingers all fall out of lock because their respective energy falls below a lock threshold, then no demodulation can take place. At this point, the data passed up in the payload frame to the RNC is set to a predetermined patterned (e.g. all zeros).

15 Hence, there is no need to pass up the payload portion of a given frame interval when there is no finger lock as there are no valid bits decoded. Eliminating the unnecessary payload reduces backhaul bandwidth requirements (backhaul bandwidth refers to the required communications bandwidth between base transceiver stations and the infrastructure responsible for controlling, coordinating, and initializing base transceiver stations typically known as the CBSC, or RNC, or SDU). Therefore, inter-carrier soft handoff is provided herein which provides an indication for the situation where a header is returned to the RNC alone without a data payload.

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This concept can be extended to the case when frames are erased (such as where CRC fails) at the BTS even though some fingers are still locked. The decision on whether to send a payload or an erased frame can be made a soft decision by using a threshold based on symbol error rate (SER), or some similar frame quality metric, as some erased frames still have useful information and the corresponding payload is needed at the RNC. Examples of quality frame metrics that can be used for the decision of whether to transmit the data include a total metric or a bit energy metric (BER) such as the estimated signal to interference ratio (SIR), signal to noise ratio (SNR) or E_b/N_t , or the like.

Thus it can be seen that a system is disclosed for assigning a new bit or using an unallocated bit pattern of an existing field in the packet header to indicate the absence of the data payload portion of the packet. This allows a reduction of the average backhaul bandwidth. This is particularly advantageous when none of the user allocated fingers are in lock at a given service base transceiver station (BTS), but can also be extended for erased frames with high SER at the discretion of the carrier/operator.

We claim:

CLAIMS

1 1. For a wireless communication system including base station
2 transceivers to communicate with at least one mobile station, the base station
3 transceivers communicating with a network controller, a method comprising
4 the steps of:

5 controlling, in a base station transceiver, a header for a packet frame to
6 be communicated between the base station transceiver and the network
7 controller wherein a portion of the header identifies the frame as one
8 containing no data package; and
9 transmitting the frame to the network controller with the constructed
10 header.

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1 2. The method according to claim 1 wherein data bits of a header field
2 contain a predetermined bit pattern for a frame including no data package.

1 3. The method according to claim 1 wherein information received by the
2 base station from the mobile station are dropped, and the header information
3 is replaced with the specified bit pattern, if a decoding metric passes a
4 threshold.

5

1 4. The method according to claim 1 wherein information received by the
2 base station from the mobile station are dropped and the header information
3 is replaced with the specified bit pattern if a CRC for the frame received from
4 the mobile station fails.

PACKET TRANSMISSION METHOD

ABSTRACT OF THE DISCLOSURE

A wireless system includes base station transceivers (102-104) to communicate with at least one mobile station (108), the base station transceivers communicate with a network controller (110). The base station controls a header for a packet frame to be communicated between the base station transceiver and the network controller wherein a portion of the header identifies the frame as one containing no data package. The data bits of the header field may contain a predetermined bit pattern for a frame including no data package. Information received by the base station from the mobile station may be dropped, and the header information replaced with the specified bit pattern, if a decoding metric passes a threshold. The information received by the base station from the mobile station may be dropped, and the header information replaced with the specified bit pattern, if a CRC for the frame received from the mobile station fails.

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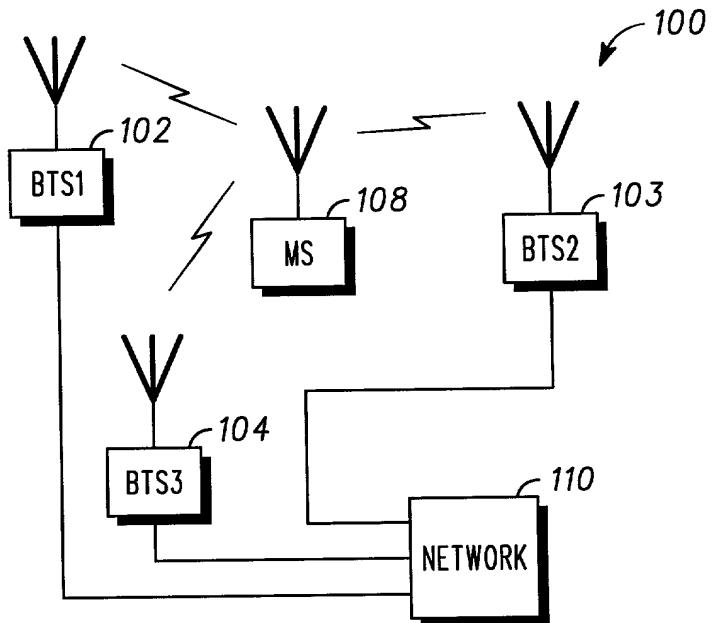


FIG. 1

00000000000000000000000000000000

200

OCTET													
7	6	5	4	3	2	1	0						
FSN					SFSN			1					
REVERSE LINK QUALITY								2					
SCALING	PACKET ARRIVAL TIME ERROR												
FPC PRIMARY SUBCHANNEL:CLTGA								4					
FPC: SIGNAL TO THERMAL NOISE RATIO						EIB		5					
LENGTH								6					
REVERSE LINK INFORMATION + LAYER 3 FILL							VARIABLE						

FIG. 2

**DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION**

Docket No. **CE08810R**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **PACKET TRANSMISSION METHOD**, the specification of which is attached hereto unless the following box is checked:

was filed on _____
 as Application No. _____
 and was amended on _____.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Claimed
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Serial No.)	(Country)	(Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Serial No.)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

_____	_____
(Serial No.)	(Filing Date)

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

<u>60/152,741</u>	<u>9/08/99</u>	<u>pending</u>
(Serial No.)	(Filing Date)	(Status - patented, pending, abandoned)
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(Serial No.)	(Filing Date)	(Status - patented, pending, abandoned)

I HEREBY APPOINT THE FOLLOWING AS MY ATTORNEY(S) OR AGENT(S) WITH FULL POWER OF SUBSTITUTION TO PROSECUTE THIS APPLICATION AND TRANSACT ALL BUSINESS IN THE PATENT AND TRADEMARK OFFICE CONNECTED THEREWITH:

NAME(S)	REGISTRATION NO.(S)	ASSOCIATE POWER OF ATTORNEY ATTACHED
Randall S. Vaas	34,479	<hr style="width: 100px; margin-left: 0;"/>
Rolland R. Hackbart	28,217	<hr style="width: 100px; margin-left: 0;"/>
Sylvia Y. Chen	39,633	<hr style="width: 100px; margin-left: 0;"/>
		<input checked="" type="checkbox"/> X Yes <input type="checkbox"/> No

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Libertyville, IL 60048

Direct Telephone Calls to:

Randall S. Vaas
at (847)523-2327

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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POST OFFICE ADDRESS Same as above		